[1647 Translated by David Clayberg]

Mount for an Adjustable Housing

~~Prior Art~~ Background of the Invention

The invention relates to a mount for an adjustable housing, in particular for a radar sensor, which is attached to the outside of a motor vehicle, according to the preamble to the main claim.

It is known, for example from DE 197 39 298 C1, for a radar sensor to be screwed to the outside of a vehicle by means of a mount. This radar sensor can, for example, be a component of a vehicle safety system which continuously processes information regarding road conditions and the distance and/or relative speed of the vehicle in relation to other vehicles. In this connection, it is necessary to align the radar sensor very precisely with the longitudinal axis of the vehicle, as a result of which it is necessary to adjust the sensor after installation in the motor vehicle, due to the sometimes significant vehicle tolerances in the vicinity of the installation point.

With the apparatus mentioned above, the adjusting process of the radar sensor in the vehicle takes place from the front (in the driving direction) by turning relatively ball-shaped heads of adjusting screws. Another screw represents the so-called stationary support.

~~Advantages of the Invention~~ Summary of the Invention

A mount of the type mentioned at the beginning, with which the position of a housing can be changed by means of at least one adjusting screw, is advantageous in the modification according to the invention, with the characterizing features of claim 1m particularly if it is not possible to access the adjusting screws from the front, for example, possibly due to vehicle parts being disposed in front of them, because this modification according to the invention significantly simplifies the mounting functions by virtue of the fact that the at least one adjusting screw on the mount is provided with a deflecting linkage. By means of the deflecting linkage, a rotary spindle on the base plate of the mount can be operated from the outside, as a result of which the adjustment is produced by turning the rotary spindle in order to turn the at least one adjusting screw in the screw thread.

In particular for attaching the housing of a radar sensor in which an adjustment of the housing is required in order to change the emission direction of the radar sensor, the deflecting linkage can advantageously produce a deflection of the rotation direction of the rotary spindle approximately at a right angle so that the rotation of the rotary spindle takes place approximately perpendicular to the emission direction.

Because of the narrow space conditions in a motor vehicle or due to an obstructed access from the front in the driving direction, it is advantageous if a radar sensor completely mounted to the motor vehicle can also be

inexpensively adjusted according to the invention from the bottom, the top, or the sides by means of adjusting screws.

In a preferred embodiment, the deflecting linkage is comprised of bevel gears; it is furthermore advantageous if at least one bevel gear on the adjusting screw can be moved and is pressed against the respective other bevel gear by means of a suitable structural design, e.g. a spring or the like. An extremely wide variation of the adjusting direction, e.g. from above, below, the left, or the right as well as a change in the bevel gear disposition can be achieved with this apparatus.

According to the invention, the screw thread that produces the movement of the housing along the longitudinal axis of the adjusting screws is advantageously disposed in the base plate of the mount.

In another advantageous embodiment, the deflecting linkage can be comprised of a worm gear and a spur-toothed wheel. In this instance, there is no danger of an inhibition or locking of the deflecting linkage due to a possibly excessive speed increasing ratio and it is therefore possible for there to be a very sensitive adjusting motion. Due to its design, this apparatus is also relatively unsusceptible to contamination.

The screw thread is constituted by a play-free thread, for example in a plastic insert in the base plate of the mount, which is self-channeling when the at least one adjusting screw is screwed in and is of the type which is intrinsically known from the prior art mentioned at the beginning. The housing can thereby be simply attached to the

mount with three screws, wherein two diagonally opposed screws can each be embodied as adjusting screws.

These and other characteristics of preferred modifications of the invention can be inferred not only from the claims, including their dependent claims, but also from the specification and the drawings, wherein the individual characteristics can each be produced for themselves alone or can be combined in the form of subcombinations in the embodiment of the invention and can be used in other areas and represent advantageous as well as individually patentable embodiments which are claimed herein.

~~Drawings~~ Brief Description of the Drawings

An exemplary embodiment of the mount according to the invention for the housing of a radar sensor on a motor vehicle will be explained in conjunction with the drawings.

Fig. 1 is a view of a radar sensor with an adjustable mount according to the prior art;

Fig. 2 is a view of a base plate of the mount according to the invention, with two adjusting screws with a deflecting linkage;

Fig. 3 shows a detail of the deflecting linkage according to Fig. 2.

Description of the ~~Exemplary Embodiments~~ Preferred Embodiments

Fig. 1 is a perspective depiction of a distance sensor 1 designed as a radar sensor, of the type that is known from the prior art DE 197 39 298 C1 mentioned at the beginning. In order to be attached to a motor vehicle by means of a mount 2, the distance sensor 1 is accommodated in a compact housing 3, which in this instance is comprised of a lower housing part 3b and an upper housing part 3a.

In this known sensor 1, the two housing parts 3a and 3b are connected to each other by means of clip connections 6. In the upper housing part 3a, a lens 5 is provided for focusing the radar emissions of the distance sensor 1. The housing 3 of the distance sensor 1 is fastened to the mount 2 by screws 9 and 10, and another screw is accommodated in a corner of the sensor 1 that is covered by the housing part 3b. The mount 2 has catch or snap elements 7 with which it can engage in detent fashion in correspondingly shaped recesses in the body of a motor vehicle; a multitude of other fasteners can also be used here.

The screws 9, 10, and 11 (see Fig. 2) engage in screw regions of the mount 2 and have a ball-shaped screw head which is supported in a correspondingly shaped recess of the housing 3, as a result of which the housing 3 can be moved in relation to the mount 2 and can therefore be adjusted. Due to their L-shaped disposition, the screws 9 and 10 and the unseen screw produce a three-point support, wherein the screw 10 and the unseen screw constitute two movable supports for horizontal and vertical adjustment of the housing 3 (adjusting screws) and the screw 9 constitutes a stationary support.

A tightening or loosening of the adjusting screw 10, for example, in the associated screw region produces a tilting of the sensor 1 around an axis that extends through the suspension points of the screw 9 and the unseen screw 11. A tightening or loosening of the unseen adjusting screw 11, for example, in the associated screw region produces a tilting of the sensor 1 around an axis that extends through the suspension points of the screws 9 and 10.

Fig. 2 shows an exemplary embodiment according to the invention of an arrangement of adjusting screws 11 and 12 on a mount 13; reference is also made here to the detailed depiction of the adjusting screw 11 according to Fig. 3. With this embodiment of the adjusting screws 11 and 12, it is possible to adjust a distance sensor which essentially corresponds to the known sensor 1 known from Fig. 1. The adjusting screws 11 and 12 here are also screwed with a self-channeling thread into plastic inserts 14 disposed in the mount 13. The only thing that must be assured here is that no further rotating motion of the screw heads disposed at the front is possible, which can be achieved, for example, by means of a cover on the sensor housing.

The adjusting screws 11 and 12 are embodied according to the invention so that they can be adjusted from underneath by means of a respective rotary spindle 15, 16. The rotating direction of the rotary spindles 15 and 16 are deflected by 90° here by means of bevel gears 17 and 18 on the adjusting screw 11 and by means of bevel gears 19 and 20 on the adjusting screw 12. The bevel gears 17 and 19 are affixed to the respective rotary spindle 15 or 16, e.g. by means of shrink-fitting or, as can be seen in Fig. 3, by

means of a frictional engagement through the use of a square or other suitable shapes (e.g. a semicircle).

The rotary spindles 15 and 16 here are supported directly on the mount 13 and a screw head is disposed at the end of each rotary spindle 15 and 16, which can be matched specifically to the intended use, for example in the form of a hexagon. The bevel gears 18 and 20 here are connected to the adjusting screws 11 and 12 with frictional engagement by means of the square ends of the adjusting screws. The bevel gears 18 and 20 can be moved parallel to the axis of the adjusting screws 11 and 12 within defined limits. The bevel gears 18 and 20 can be pressed against the bevel gears 17 and 19 by means of a spring 21 (see Fig. 3) or by means of a suitable embodiment of the plastic insert.

For example, if the rotary spindle 15 is turned, then the bevel gears 17 and 18 and the adjusting screw 11 as well are turned along with it. The adjusting screw 11 is screwed in and out by means of the play-free thread-channeling support of the adjusting screw 11 in the plastic insert 14 of the mount 13. The bevel gear 18 thereby moves longitudinally in relation to the axis of the adjusting screw 11. The initiation of the screw motion for adjusting the above-described radar sensor consequently takes place according to the invention offset by 90° in relation to the rotation direction of the adjusting screws 11 and 12. The Figs. depict the possibility of an adjustment from the bottom, but an adjustment from the top, the left side, or the right side is also possible. This merely requires a change in the disposition of the bevel gears in relation to one another.

In a modification of the above-described deflecting linkage according to Figs. 2 and 3, which modification is not shown here, this deflecting linkage can be comprised of a worm gear and a spur-toothed wheel, which have an action comparable to that of the bevel gears in deflecting the rotation direction.